

Community – Acquired Pneumonia (CAP): Pediatric

Respiratory

Clinical Decision Tools for RNs with Additional Authorized Practice [RN(AAP)s]

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Background

Community-acquired pneumonia (CAP) is an infection of the lower respiratory tract that is acquired outside a hospital and/or long-term care facility (Brashers & Huether, 2019). The condition is associated with fever, respiratory symptoms, and altered findings on physical examination and infiltrates on chest x-ray. Pneumonia typically follows an upper respiratory tract infection that promotes invasion of the lower respiratory tract by viruses, bacteria, fungi, or parasites (Brashers & Huether, 2019). The highest incidence of CAP is in children ages five years and younger (Anti-infective Review Panel, 2019). In infants and young children, viruses are the most common cause of CAP. Respiratory syncytial virus (RSV) is the most common cause of viral pneumonia in infants (Anti-infective Review Panel, 2019; Brashers & Huether, 2019).

Other viral pathogens for other age groups include parainfluenza, influenza, human rhinovirus, human metapneumovirus, and adenoviruses (Brashers & Huether, 2019). *Streptococcus pneumoniae* (*S. pneumoniae*) is the most common bacterial pathogen in children between three months of age and five years (Anti-infective Review Panel, 2019). Other causative bacterial pathogens include *Staphylococcus aureus* (one week to two years of age), *Mycoplasma pneumoniae* (school age and adolescents), *Chlamydia pneumoniae* (school age and adolescents), and *Group A streptococci* (all ages) (Brashers & Huether, 2019).

Immediate Consultation Requirements

The RN(AAP) should seek immediate consultation from a physician/NP when any of the following circumstances exist:

- decreased mental alertness;
- inspiratory stridor;
- pallor or central cyanosis;
- increased work of breathing;

- periods of apnea;
- nasal flaring;
- retractions/indrawing (substernal, intercostal, suprasternal notch (tracheal tug), supraclavicular);
- grunting;
- poor feeding and/or need for rehydration;
- toxic-appearing infant or child, may be pale or cyanotic and is often lethargic or inconsolably irritable. In addition, tachypnea and tachycardia with poor capillary refill may be present;
- ≤ 12 months of age; and/or
- immunocompromised status (Interprofessional Advisory Group [IPAG], personal communication, October 14, 2019).

Predisposing and Risk Factors

Predisposing and risk factors for pediatric CAP include:

- age younger than two years,
- overcrowded living conditions,
- winter season,
- recent antibiotic treatment,
- attendance at daycare,
- passive smoke exposure,
- nutritional deficiencies,
- asthma,
- cystic fibrosis,
- cerebral palsy,
- congenital heart disease,
- bronchopulmonary dysplasia,
- neuromuscular disorders (swallowing disorders that pose a risk for aspiration),
- gastroesophageal reflux disease (GERD; may cause recurrent pneumonia),
- tracheoesophageal fistula (may cause recurrent pneumonia),
- immunodeficiency disorders, and
- congenital anomalies of the respiratory tract (Brashers & Huether, 2019).

Health History and Physical Exam

Subjective Findings

The following symptoms may be reported in **infants**:

- history of mild upper respiratory infection (URI);
- lethargy or irritability;
- abrupt high fever with chills, cough, and dyspnea suggests bacterial pneumonia whereas slower onset of respiratory symptoms suggests a viral cause;
- history of *group B streptococcal* or *C. trachomatis* infection in the mother;

- if there is conjunctivitis with eye discharge, consider Chlamydia or adenovirus as causative organisms;
- neonates exposed to drug use or lack of prenatal care;
- wheezing (more common in viral pneumonia); and
- neonates may have respiratory symptoms without a fever or a fever only with mild or no signs or symptoms of pneumonia (Burns, Dunn, Brady, Starr, & Blosser, 2016).

The following symptoms may be reported in **children and adolescents**:

- history of mild URI;
- restlessness;
- apprehension;
- malaise;
- pleuritic chest pain;
- sick contacts at home/school;
- sudden onset of high fever, cough, chest pain, chills (most common with bacterial causes); and
- slower onset of chills, headache, sore throat, gastrointestinal symptoms, and malaise is suggestive of viral pneumonia (Burns et al., 2016).

For all age groups, the RN(AAP) should enquire about:

- recent history of foreign body aspiration;
- history of asthma;
- immunization status;
- recent antibiotic use;
- oral intake;
- urine output;
- exposure to contacts with pertussis, tuberculosis (TB); and
- history of recent travel.

Objective Findings

Physical findings common to **all types** of pneumonia in infants and young children include:

- increased work of breathing (nasal flaring, grunting, retractions),
- tachypnea,
- cyanosis,
- dullness to percussion, and
- fine crackles and diminished breath sounds on auscultation (Burns et al., 2016).

Physical findings common to **bacterial** pneumonia in infants and young children include:

- decreased level of consciousness,
- circumoral cyanosis,
- pleuritic chest pain and splinting of affected side,

- decreased pulse oximetry, and
- decreased capillary refill (Burns et al., 2016).

Physical findings common to **viral** pneumonia in infants and young children include wheezing (Burns et al., 2016).

Physical findings common to all types of pneumonia in children and adolescents up to the age of 18 include:

- fever, common with bacterial pneumonia, and uncommon with atypical bacterial pneumonia, viral pneumonia, and pertussis;
- decreased level of consciousness;
- tachypnea;
- accessory muscle use;
- wheezes or crackles;
- retractions;
- decreased tactile fremitus;
- diminished breath sounds;
- decreased pulse oximetry;
- dullness to percussion and decreased breath sounds may be noted with increasing consolidation; and
- productive cough (bacterial) or dry cough (viral) (Burns et al., 2016).

Differential Diagnosis

The following should be considered as part of the differential diagnosis:

- bronchiolitis,
- bronchitis,
- asthma,
- pulmonary trauma,
- atelectasis,
- pneumothorax,
- croup,
- foreign body aspiration (especially in young children),
- toxin inhalation (e.g., insecticides),
- meningitis,
- sepsis,
- chronic/congenital pulmonary/cardiac disease, and
- gastroesophageal reflux disease (Burns et al., 2016; Richardson, 2020).

Making the Diagnosis

A diagnosis of pneumonia is made based on the presence of one or more factors listed in the *Health History and Physical Exam* section. No single sign or symptom can definitively rule in or rule out pneumonia in infants.

Investigations and Diagnostic Tests

Community-acquired pneumonia may be determined by clinical findings alone. A chest x-ray should be considered for the following:

- severe symptoms (toxic appearing child);
- when clinical findings are inconclusive;
- to exclude pneumonia in young children less than two years of age;
- fever $\geq 39^{\circ}\text{C}$ oral or older children with cough and fever $\geq 38.5^{\circ}\text{C}$ oral; and
- to exclude other causes of respiratory distress, especially in the presence of cardiac or pulmonary conditions (Richardson, 2020).

Management and Interventions

Goals of Treatment

The primary goals of immediate treatment are to identify signs and symptoms of respiratory compromise, relieve symptoms, prevent complications, prescribe antimicrobial therapy as appropriate, and prevent further respiratory compromise (Winland-Brown & Porter, 2019).

Non-Pharmacological Interventions

The RN(AAP) should recommend, as appropriate, the following non-pharmacological options:

- increased rest,
- adequate fluid intake for age/weight,
- position of comfort to facilitate breathing, and
- humidified air to relieve irritated nares and pharynx (Winland-Brown & Porter, 2019).

Pharmacological Interventions

The pharmacological interventions recommended for the treatment of CAP in the pediatric population are in accordance with the *RxFiles Drug Comparison Charts* (RxFiles Academic Detailing Program, 2021) and the *Anti-infective Guidelines for Community-acquired Infections* (Anti-infective Review Panel, 2019).

Analgesics and Antipyretics

	Drug	Dose	Route	Frequency	Duration
Pediatric					
	Acetaminophen	15 mg/kg/dose (maximum dose 75 mg/kg/day)	p.o.	q4-6h prn	5-7 days
AND / OR	Ibuprofen	10 mg/kg/dose (maximum dose 40 mg/kg/day)	p.o.	q6-8h prn	5-7 days

Oral Antibiotics

	Drug	Dose	Route	Frequency	Duration
Pediatric (≥ 1 year to ≤ 5 years of age without penicillin allergy)					
	Amoxicillin	40-90 mg/kg/day (maximum 4 g/day) Use high dose if local resistance to <i>S. pneumoniae</i> is high.	p.o.	divided b.i.d. or t.i.d.	7-10 days
OR	Amoxicillin/ clavulanate 7:1	80 mg/kg/day (based on amoxicillin; maximum 3 g/day)	p.o.	divided b.i.d.	7-10 days
OR	Cefuroxime	20-30 mg/kg/day (maximum 500 mg/dose)	p.o.	divided b.i.d.	7-10 days
Pediatric (> 5 years to ≤ 18 years of age)					
	Clarithromycin	15 mg/kg/day (maximum 1 g/day)	p.o.	divided b.i.d.	7-10 days
OR	Azithromycin	10 mg/kg/day on day 1 and then 5 mg/kg/day on days 2-5 (maximum 500 mg/day)	p.o.	once daily	5 days

Pediatric ≥ 8 years					
OR	Doxycycline	4 mg/kg/day (maximum dose 200 mg/ day)	p.o.	divided q12h	7-10 days
	Drug	Dose	Route	Frequency	Duration
Pediatric (with penicillin allergy)					
	Clarithromycin	15 mg/kg/day (maximum 1 g/day)	p.o.	divided b.i.d.	7-10 days
OR	Azithromycin	10 mg/kg/day on day 1 and then 5 mg/kg/day on days 2-5 (maximum 500 mg/day)	p.o.	once daily	5 days

Client and Caregiver Education

The RN(AAP) provides client and caregiver education as follows:

- Counsel about appropriate use of medications, such as purpose, dose, frequency, and side effects.
- Explain the nature, course, and expected outcomes of the illness.
- Educate about the signs of respiratory distress.
- Recommend adequate fluids to prevent dehydration.
- Encourage rest and a propped-up position while awake.
- Return to the clinic if any concerns.
- Recommend routine immunizations (Burns et al., 2016; Richardson, 2020).

Monitoring and Follow-Up

The RN(AAP) should instruct the client to return for reassessment within 24 hours or sooner if symptoms worsen or shortness of breath develops. The client should be reassessed after the course of antibiotics is completed.

Complications

The following complications may occur:

- pleural effusion;
- pericarditis;
- empyema;
- bronchiectasis;
- lung abscesses (aspiration is a common underlying factor);

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- bacterial dissemination to blood, central nervous system (e.g., meningitis), heart, skin, or joints;
- toxic shock syndrome;
- respiratory failure and cardiovascular collapse;
- pneumatoceles (form with empyema and usually resolve over time);
- necrotizing pneumonia;
- pneumothorax; or
- hyponatremia (with severe pneumonia) (Burns et al., 2016; Richardson, 2020).

Referral

Refer to a physician/NP if client presentation is consistent with those identified in the *Immediate Consultation Requirements* section or if there is a failure to respond to the prescribed treatment within 24-48 hours (IPAG, personal communication, October 14, 2019; Winland-Brown & Porter, 2019).

References

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